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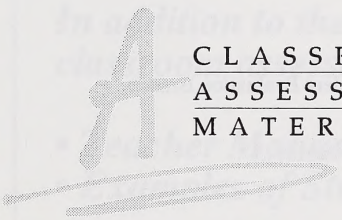
SCIENCE 10

STUDENT MATERIALS

CLASSROOM
ASSESSMENT
MATERIALS

SCIENCE 10

STUDENT MATERIALS



CLASSROOM
ASSESSMENT
MATERIALS

Alberta
EDUCATION

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Science 10

This package of Student Materials contains

- *End-of-Course Exam*
- *Performance Assessment*

In addition to the Student Materials, this classroom assessment package includes

- *Teacher Manual*
- *Examples of Students' Responses*

CLASSROOM ASSESSMENT MATERIALS

Science 10

End-of-Course Exam

CLASSROOM
ASSESSMENT
MATERIALS

Science 10 *Name:* _____

End-of-Course Exam

Description

Time allotted: 2.0 h. You may take an additional 0.5 h to complete the examination if needed.

Total possible marks: 68

This is a **closed-book** examination consisting of:

- 43 selected-response questions, each with a value of one mark
- 5 numerical-response questions, each with a value of one mark
- 4 written-response questions for a total of 20 marks

This examination contains sets of related questions.

A set of questions may contain selected-response and/or numerical-response and/or written-response questions.

A science data booklet is provided for your reference.

Selected Response (43 questions)

- Decide which of the choices **best** completes the statement or answers the question.
- Record that answer as instructed by your teacher.

Numerical Response (5 questions)

- Read each question carefully. Calculate or determine a numerical answer.
- Record your answer as instructed by your teacher.

Written Response (4 questions)

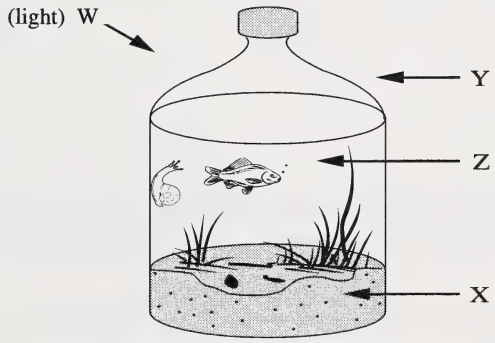
- Write your answers, as neatly as possible, in the space provided.
- For full marks, your answers **must show all** pertinent explanations, calculations, and formulas.
- Your answers **should be** presented in a well-organized manner, using complete sentences for a written response and correct units and significant digits for a calculated response.

A number of Alberta schools set up a "bottle lake" experiment. The experiment was designed to determine the best conditions for maintaining living organisms in a simulated environment.

Use the following information to answer the next four questions.

Materials used to make a "bottle lake":

- 3 L bottle sealed with a screwtop lid
- living organisms and pond water
- sediment from a warm, shallow lake
- aquatic plant life
- warm, sunny window



1. The letter on the diagram that **best** corresponds to Earth's hydrosphere is

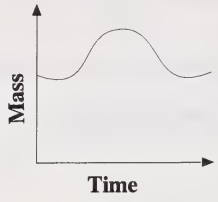
A. W
B. X
C. Y
D. Z

2. An example of an autotroph in the bottle lake is the

A. fish
B. snail
C. water
D. plant

3. The graph that **best** represents the changes for the entire bottle lake system during the duration of the experiment is

A.



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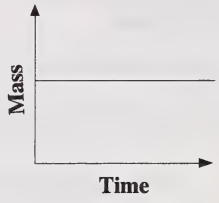

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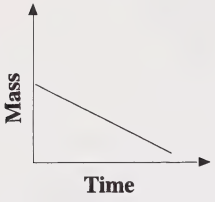

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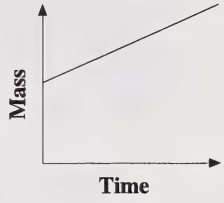


Written Response

1. **a.** Write a balanced chemical equation that includes the states of matter to summarize the process the plant in the bottle uses to capture solar energy. (2 marks)

Continued

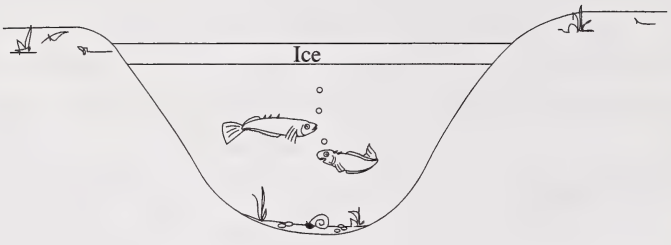
Continued

b. You are to determine which factor or factors are essential in maintaining the bottle lake. Describe an experimental design with a control you could use to determine this. (2 marks)

In cold regions of the world, the unique properties of water are important to the survival of aquatic species.

Use the following information to answer the next question.

A Pond in Winter



4. The **most likely** temperatures, in °C, from the top of the pond to the bottom of the pond are

A. 0, –4, –3, –2, –1
B. 0, +1, +2, +3, +4
C. 0, +4, +3, +2, +1
D. 0, –1, –2, –3, –4

Numerical Response

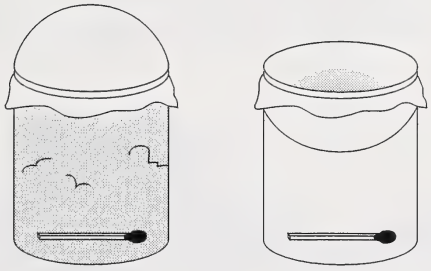
1. When 2.00 kg of pond water at 25.0°C cool to 12.0°C, the quantity of energy released to the environment is _____ kJ.

Humans have been observing and studying the weather for centuries.

Use the following information to answer the next question.

To better understand the formation of fog, students set up the "fog in a jar" experiment shown here. An extinguished, smoldering match was placed in each of 2 jars and a rubber balloon was tightly stretched over the opening. They made the following observations:

- when the stretched balloon was pulled upward, fog formed in the jar (A)
- when the stretched balloon was pushed downward, the fog disappeared (B)



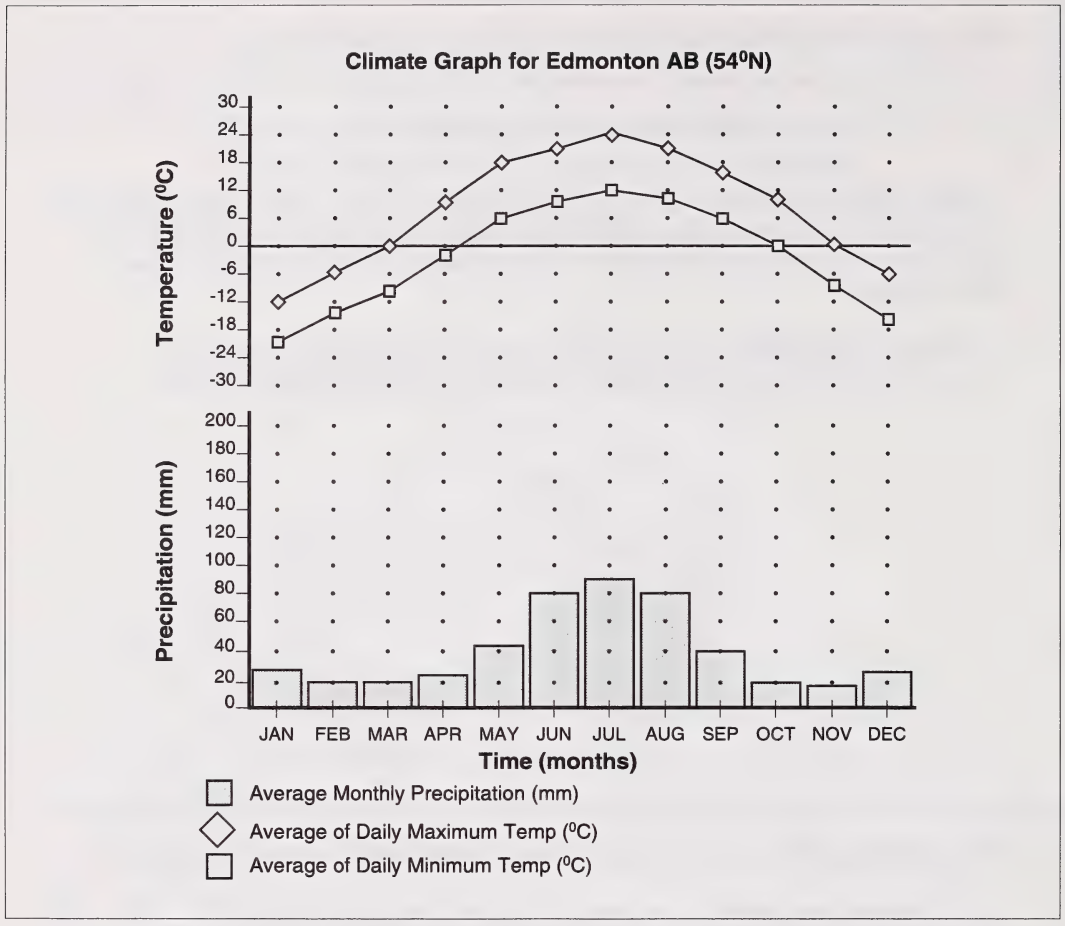
Fog
A

No fog
B

5. The formation of the fog in A can be explained on the basis that the air in the jar is

A. expanding and warming, resulting in the condensation of water
B. expanding and cooling, resulting in the condensation of water
C. compressing and warming, resulting in the evaporation of water
D. compressing and cooling, resulting in the evaporation of water

Use the following information to answer the next three questions.



6. In the climate graph, the manipulated variable is

A. time
B. location
C. temperature
D. precipitation

7. In an average year in Edmonton, the **total** precipitation during the summer months (June, July, and August) is approximately

A. 80 mm
B. 90 mm
C. 170 mm
D. 250 mm

8. Prince Rupert is located on the west coast of Canada, at the same latitude as Edmonton. When compared to the climate graph for Edmonton, the climate graph for Prince Rupert would show

A. more seasonal variation in temperature and more precipitation
B. more seasonal variation in temperature and less precipitation
C. less seasonal variation in temperature and more precipitation
D. less seasonal variation in temperature and less precipitation

---

9. The benefits to society of using weather-tracking technologies are largely

A. environmental and economic
B. economic and scientific
C. political
D. ethical

A group of students studied a lake as part of their assignment in Science 10. The students collected water samples and observed organisms under the microscope.

Use the following information to answer the next question.

Procedures for Using a Microscope

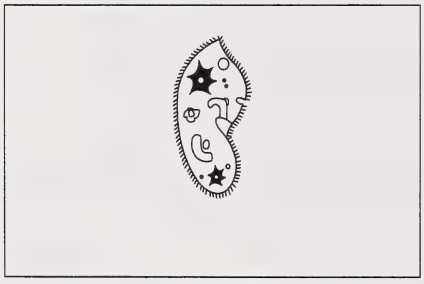
1. Use the fine focus to obtain a clear image.
2. Raise the stage until it is close to the low power lens.
3. Use the coarse focus to bring the specimen into view.
4. Place a prepared slide on the stage.

Numerical Response

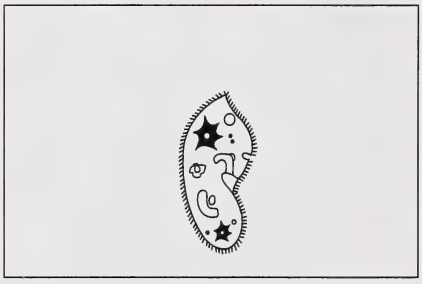
2. The above steps, arranged in the correct order, are _____, _____, _____, _____.

Use the following information to answer the next question.

The photographs show what was observed in the field of view of the microscope in two different situations.



Photograph 1



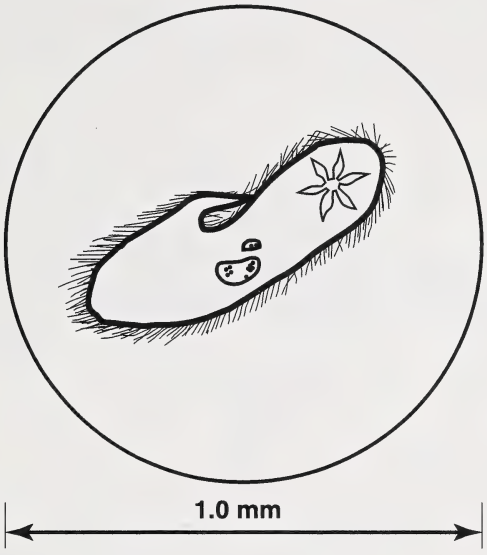
Photograph 2

10. If the paramecium did not move, the change in position of the paramecium from Photograph 1 to Photograph 2 was the result of

A. moving the slide toward oneself
B. moving the slide away from oneself
C. changing to a higher power objective
D. changing to a lower power objective

Use the following information to answer the next question.

Field View of a Wet Mount



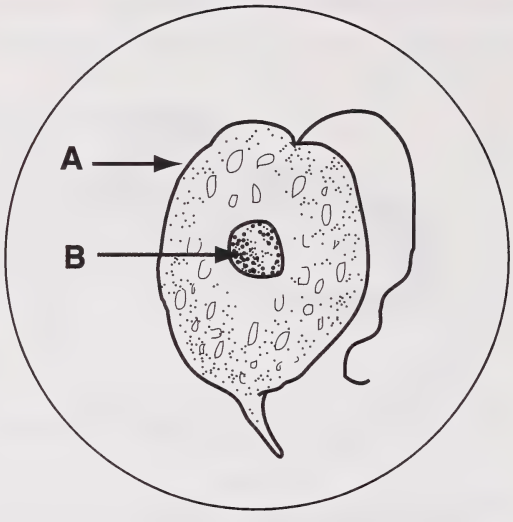
Note: 1 mm = 1 000 **m**m

11. The length of the organism in the field of view is approximately

A. 100 **m**m
B. 300 **m**m
C. 700 **m**m
D. 1 000 **m**m

Use the following information to answer the next two questions.

Microscope View of a Wet Mount



12. Part A should be labelled as the

A. nucleus
B. cytoplasm
C. mitochondrion
D. cell membrane

13. Part B would function to

A. collect excess water
B. carry out cellular respiration
C. allow matter to enter and leave the cell
D. control cell activities, including reproduction

Use the following information to answer the next question.

The first simple microscope was built by Anton van Leeuwenhoek in about 1672. He used it to observe pond water and was surprised to find it teeming with one-celled organisms he called "animalcules." As microscopes became more sophisticated, scientists began studying a variety of cells, and a whole branch of biology devoted to this study developed.

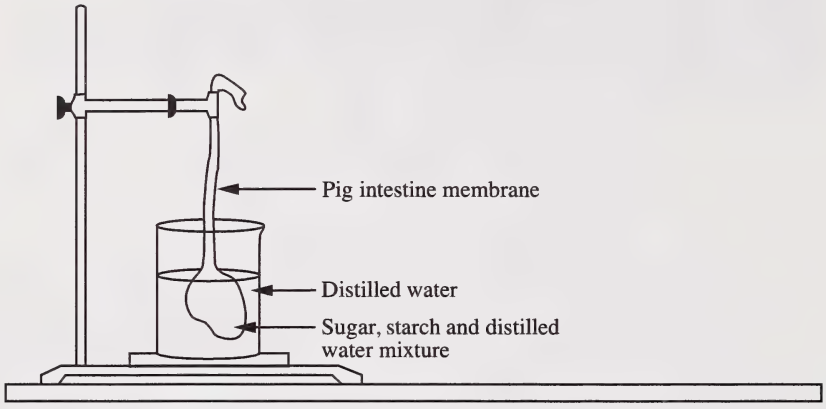
14. This story **best** illustrates

A. the way in which technology advances science
B. how the work of scientists and technologists differs
C. the risks and benefits to society of introducing a technology
D. how the testing and revising of theories leads to a better understanding of natural phenomena

The exchange of matter with the environment is a basic function of living systems.

Use the following information to answer the next question.

The following demonstration was set up at the beginning of the class period. The water in the beaker was tested with iodine and Benedict's solution and neither changed colour. Several hours later, the water in the beaker was tested again. The Benedict's solution changed colour, but the iodine did not.

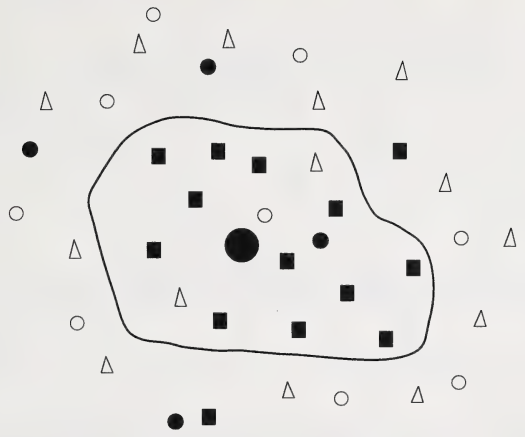


15. The **most likely** reason the iodine did not change colour is that

A. iodine could not diffuse across the membrane
B. sugar molecules are larger than starch molecules
C. the membrane was permeable to sugar molecules
D. the membrane was impermeable to starch molecules

Use the following information to answer the next question.

Distribution of Four Different Kinds of Molecules Inside and Outside the Cell

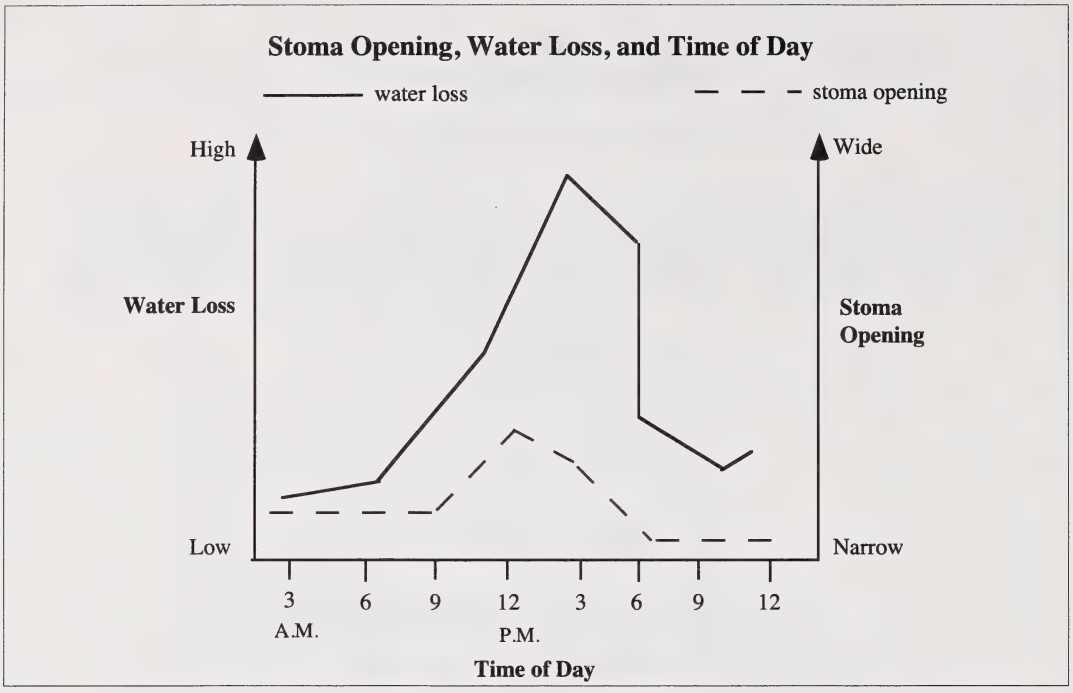


Note: The cell membrane is equally permeable to each kind of molecule.

16. Imagine that molecule ○ is a poisonous substance. Given the present concentration gradient, what would happen in the cell to ensure its survival?

A. All ○ molecules would diffuse to the outside environment.
B. Water would enter by osmosis, thereby diluting the toxic substance.
C. The ■ molecules would diffuse into the cell to reach an equilibrium.
D. Molecules of ○ would be actively transported to the outside environment.

Use the following information to answer the next question.



17. An interpretation that **could** be made from the graph is that

A. water loss is greatest in the early afternoon
B. water loss and stoma opening are independent
C. the stoma open and close in response to humidity
D. the stoma open widest when the temperature is highest

Written Response

2. Calculate the **volume**, the **surface area**, and the **surface area-to-volume ratio** for three cubes of the following sizes:

Cube	Length of each side (cm)
A	10.0
B	5.0
C	2.0

a. Construct a labelled table and enter the results of the required calculation for each cube. (2 marks)

b. Which cube, if it represented a living cell, would have the most efficient exchange of matter and energy with the environment? (1 mark)

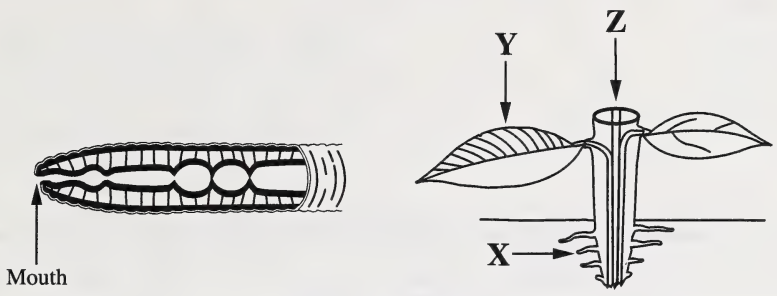
c. Describe a technology that applies the principle of large surface area-to-volume ratio and explain how it facilitates matter or energy exchange with the environment. (2 marks)

Although the nutritional requirements of animals and plants are quite different, certain analogies (similarities in function) can be drawn.

18. The blood vessels in humans serve the same function as the

A. root system in plants
B. lysosomes in eukaryotic cells
C. digestive tract in an earthworm
D. vascular tissue (xylem and phloem) in plants

Use the following information to answer the next question.



19. The function of the mouth in the earthworm is performed by which part(s) in the plant?

A. Y only
B. X only
C. X and Y
D. X, Y, and Z

One weekend, Terry and Jerry are doing some chores around the house and yard.

Use the following information to answer the next two questions.

Jerry decides to bake bread. At school, he learned that bread rises because a process called fermentation occurs in yeast cells, according to this unbalanced reaction equation:

$$C_6H_{12}O_{6(s)} \text{ Æ } C_2H_5OH_{(l)} + CO_{2(g)}$$

20. The reactant(s) in this reaction is/are

A. water
B. glucose
C. carbon dioxide
D. ethanol and carbon dioxide

21. The coefficients for balancing this equation are:

A. 1 Æ 1, 1
B. 1 Æ 1, 2
C. 1 Æ 2, 2
D. 2 Æ 2, 2

Use the following information to answer the next question.

WHMIS Symbols

22. Terry is washing the walls with a product called TSP ($Na_3PO_{4(s)}$), which has the above symbols on the label. The label indicates to Terry that this product

A. has toxic effects and is explosive
B. has toxic effects and is corrosive
C. is highly reactive and corrosive
D. is explosive and corrosive

Use the following information to answer the next two questions.

Jerry decides to fertilize the flower beds. The phosphate fertilizer Jerry decides to use is prepared at an industrial plant in Fort Saskatchewan by a number of steps, one of which is a reaction between calcium phosphate and sulphuric acid, according to this equation:

$$Ca_3(PO_4)_{2(s)} + 3H_2SO_{4(aq)} \text{ Æ } 3CaSO_{4(s)} + 2H_3PO_{4(aq)}$$

23. The acid formed by this reaction is called

A. hydrogen phosphate
B. calcium phosphate
C. phosphoric acid
D. sulphuric acid

24. As he mixes the fertilizer with water, Jerry thinks of the particles swirling around in the bucket. The chemical species, listed **from smallest mass to largest mass**, are

A. $H_2O_{(l)}, CaSO_{4(aq)}, H^+_{(aq)}, PO_4^{3-}{}_{(aq)}$
B. $H^+_{(aq)}, H_2O_{(l)}, , PO_4^{3-}{}_{(aq)}, CaSO_{4(aq)}$
C. $CaSO_{4(aq)}, PO_4^{3-}{}_{(aq)}, H_2O_{(l)}, H^+_{(aq)}$
D. $H^+_{(aq)}, CaSO_{4(aq)}, H_2O_{(l)}, PO_4^{3-}{}_{(aq)}$

A group of students studied a lake as part of their assignment for Science 10.

25. Al had heard about acid rain and wondered about the pH of the lake water. He tested it with a pH meter and found it to be 5.9. He should infer that the water was

A. neutral, and not harmful to most aquatic organisms
B. very acidic, and harmful to most aquatic organisms
C. slightly basic, and harmful to most aquatic organisms
D. slightly acidic, and not harmful to most aquatic organisms

26. Mari noticed a cement plant operating at one end of the lake. She investigated and found out that calcium carbonate is occasionally released into the lake water. Mari should most likely conclude that this substance

A. contains a toxic heavy metal that could kill fish
B. is a strong acid and would lower the pH of the lake
C. is insoluble in water and would likely settle to the bottom of the lake
D. is very reactive and produces ammonia gas when it reacts with water

A technician was given samples of four elements to test. He summarized his experimental results and additional information about the elements in a chart.

Use the following information to answer the next two questions.

Element	Experimental Results	Additional Information
A	• soft, shiny, malleable • reacts vigorously with water to produce hydrogen gas	• a component of many salt compounds, for example table salt
B	• greenish, pungent gas • reacts vigorously with sodium to form a white compound	• diatomic gas
C	• clear, colourless gas • chemically unreactive	• monatomic gas
D	• malleable, shiny conductor • dissolves in acid	• reacts with element B to form compound DB_2

Group Names

1. alkaline metal
2. alkaline earth metal
3. halogen
4. noble gas

Numerical Response

3. Match each number of a group name to an element.

A _____ **B** _____ **C** _____ **D** _____ .

27. In a reaction between elements B and D, 35 g of B react with D to produce 47 g of DB_2. The mass of element D used up would be predicted to be

A. 12 g
B. 35 g
C. 47 g
D. 82 g

Lead is considered to be a heavy metal pollutant. Lead enters the environment from a variety of human activities, including coal burning, roasting metal ores, industrial production of car (lead storage) batteries, leaded gasoline, and paints containing lead.

28. Once in the human body, lead interferes with a number of active processes requiring ATP. A cellular process in the human body that could be affected by lead is

A. osmosis
B. diffusion
C. endocytosis
D. photosynthesis

Use the following information to answer the next question.

The medical treatment for removing excess lead from the body is chelation therapy. The substance used is calcium EDTA, an abbreviation for a complex substance called ethylenediaminetetraacetic acid, which reacts with the lead ions according to this equation:

$$CaEDTA + Pb^{2+} \text{ Æ } PbEDTA + Ca^{2+}$$

29. This reaction is an example of a

A. formation reaction
B. replacement reaction
C. decomposition reaction
D. hydrocarbon combustion reaction

30. Calcium ions have a 2+ charge because they have

A. lost two protons
B. lost two electrons
C. gained two protons
D. gained two electrons

31. When lead (II) ions and phosphate ions react, the resulting compound would be expressed by the formula

A. $PbPO_{4(s)}$
B. $Pb_3PO_{4(s)}$
C. $Pb_3(PO_4)_{2(s)}$
D. $Pb_2(PO_4)_{3(s)}$

Use the following information to answer the next question.

While performing an experiment, a student was observed:
1. diluting an acid by adding it to water
2. determining if a solution was basic by touching it to see if it was slippery
3. identifying a gas by fanning the fumes toward her nose
4. looking directly into the top of the test tube for signs of reaction

32. The student demonstrated safe laboratory technique in steps

A. 1 and 2
B. 1 and 3
C. 1 and 4
D. 2 and 3

Half of the sulphur dioxide entering the air is from the burning of fuels such as coal and natural gas. The sulphur in the fuel reacts with oxygen from the air to produce sulphur dioxide, which ends up in the smoke emitted from chimneys or smokestacks.

Written Response

3. **a.** Write **a balanced equation** that includes the **states of matter** for the production of sulphur dioxide as described. (2 marks)

b. In recent years, power plants and factories have installed taller chimneys to avoid polluting nearby air. Explain why tall chimneys are not a complete answer to the problem of sulphur dioxide emission. (1 mark.)

Continued

c. Describe the role that weather conditions might play in the effect of sulphur dioxide on a particular locality. (1 mark)

d. Suggest a possible solution to the problem of air pollution from sulphur dioxide. (1 mark)

Use the following information to answer the next question.

Chlorofluorocarbons (CFCs) were introduced into products ranging from refrigerators to foam mattresses and aerosol sprays in the 1950s, because of their unique chemical properties. Most scientists now believe that CFCs break down the ozone layer of the upper atmosphere, thus allowing UV rays to reach Earth in harmful amounts.

33. The development by scientists and technologists of chemicals like CFCs illustrates the

A. way in which scientists use technology
B. ways in which science and technology differ
C. risks and benefits to society of introducing a new technology
D. role of hypothesis and evidence in the development of scientific knowledge

The efficient conversion and use of energy forms influences decisions regarding the production and use of goods and services. A group of Science 10 students investigated cost and efficiency of a variety of energy conversions.

Use the following information to answer the next question.

	Conversion	Efficiency (%)
1	Electrical energy from burning fossil fuels	32–42
2	Electrical energy from dams (hydroelectric)	82–88
3	Electrical energy from uranium (nuclear)	27–29
4	Electrical energy from wind	35–45

34. Which of the following is a **correct** statement related to these energy conversions?

A. Conversion 3 is the cheapest and requires few safety precautions.
B. Conversion 2 is most efficient and does not affect the environment.
C. Conversion 4 is efficient compared to the others and is very reliable.
D. Conversion 1 is inefficient compared to the others and consumes non-renewable resources.

35. Using 2 AA cells in a flashlight, a student found that the 2.0 W bulb remained lit for 3.5 ¥ 10^5 s. The amount of electrical energy consumed was

A. 1.8 ¥ 10^5 J
B. 7.0 ¥ 10^5 J
C. 1.8 ¥ 10^6 J
D. 7.0 ¥ 10^6 J

36. The potential energy that is converted to electrical energy in a hydroelectric power plant is

A. thermal potential energy
B. nuclear potential energy
C. chemical potential energy
D. gravitational potential energy

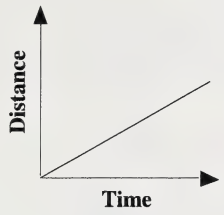
37. The students conducted an experiment to determine the efficiency of an electric kettle. They calculated that it requires 1.3 ¥ 10^5 J of energy to heat a sample of water. If this process took 120 s, the efficiency of the kettle, rated at 1 200 W, is

A. 92%
B. 20%
C. 75%
D. 10%

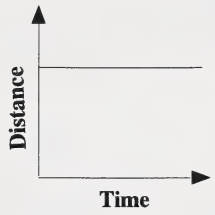
A group of friends decided to investigate a variety of exercises.

38. Ted ran at a constant speed of 8 km/h for 20 min. The graph that **best** represents the distance he covered during this time is

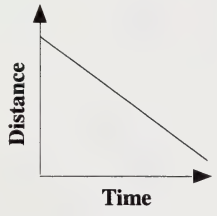
A.



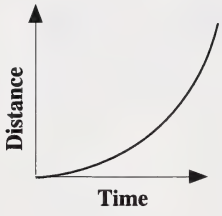
B.



C.



D.



39. Susan decided to lift weights to increase her muscle mass. Over a period of 3.00 minutes, she lifted 50.0 N a height of 0.500 m for each repetition. She did 25 repetitions. The amount of work Susan did during the workout was

A. 12.5 J
B. 150 J
C. 625 J
D. 1.88 kJ

Use the following information to answer the next two questions.

> Two friends know that exercise is used to balance food intake with energy requirements. Cycling requires approximately 2.1 MJ of energy per hour. Jan and Eric stopped for breakfast before their Sunday morning bike ride. Eric's breakfast had an energy content of 2.02 MJ.

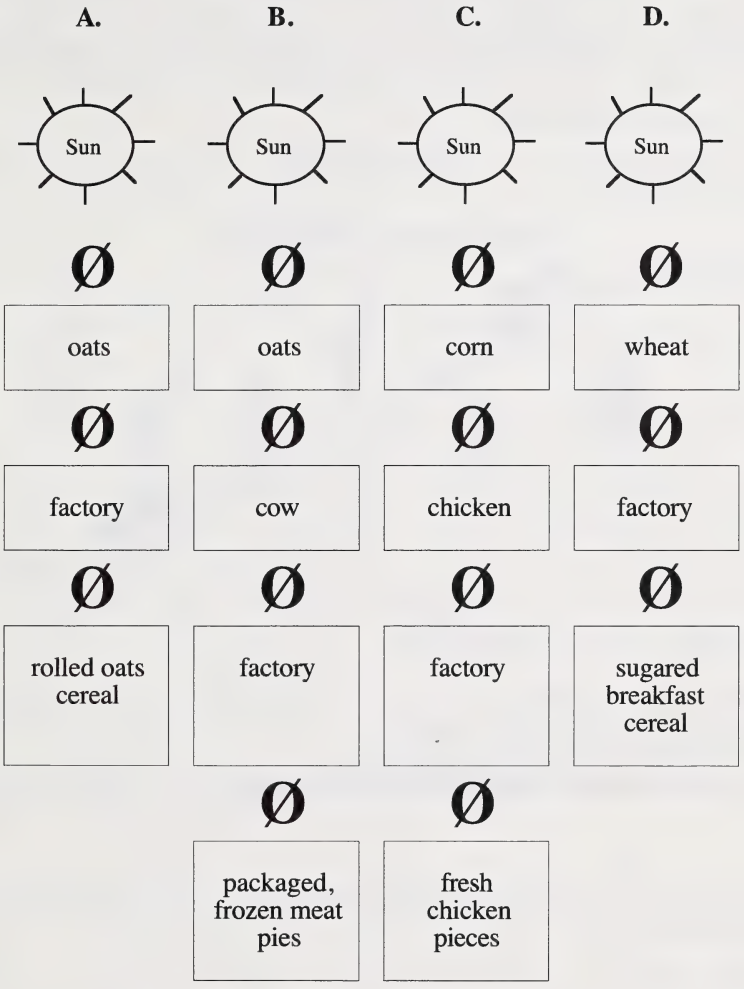
Numerical Response

4. The length of time Eric needs to cycle in order to "burn off" his breakfast is _____ h.

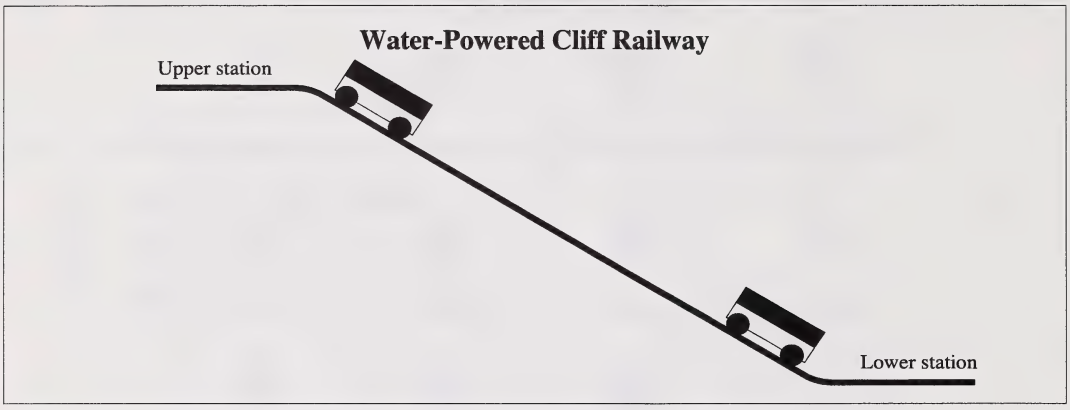
40. In order to **decrease** the amount of energy required for cycling, Eric should

A. wear loose, baggy clothing
B. maintain an upright posture
C. change to wide, knobby tires
D. use a lighter-weight bike frame

41. Erin investigated energy conversions in the production of food. The process she would **most likely** identify as consuming the **greatest amount** of energy is illustrated in



A Centre for Alternative Technology is located near Machynlleth, Wales. A unique piece of environmental engineering, the Centre's water-powered cliff railway can take 15 people up (or down) a steep incline. When passengers come out of the upper station, they see the lake that serves as a store of water (and energy) for the cliff railway. It operates on the principle of "water balancing." The two cars are connected by cable. Water is run from the lake into a tank beneath the upper car until it is just heavier than the lower car, then
the parking brakes are released.



42. The energy source for this railway is the

A. kinetic energy of water
B. kinetic energy of the upper carriage
C. gravitational potential energy of water
D. gravitational potential energy of the upper carriage

43. According to the information provided, the Centre would be considered "environmentally friendly" because it

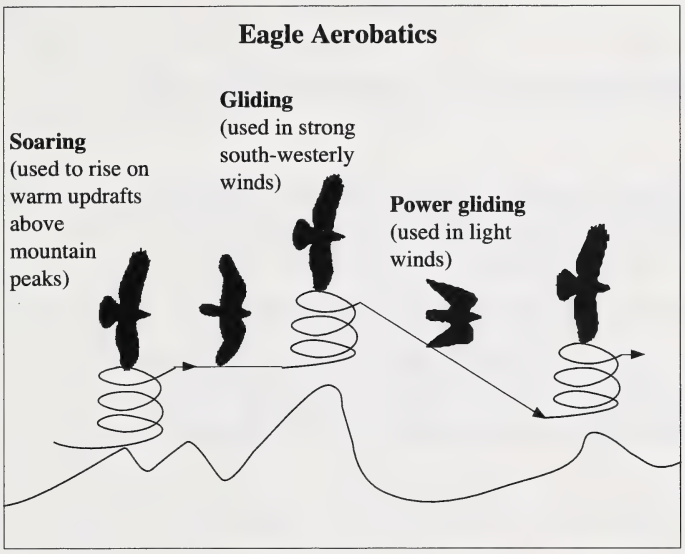
A. is 100% efficient
B. uses only non-renewable resources
C. does not disturb aquatic life in the water
D. uses renewable resources, such as water and wind

Numerical Response

5. At the upper station, the car is 35.0 m above the lower station.
When fully loaded with 15 people, the car has a mass of 1 775 kg. The potential energy of the loaded car at the upper station is _____ kJ.

Migrating eagles have been known to travel 700 km in a day. To assist their flight, they rely on rising, warm air spirals above mountain peaks. For brief stretches between these peaks, eagles can fly as fast as 150 km/h. This type of flight is known as power gliding.

Use the following information to answer the next question.



Written Response

4. **a.** At what time of day would eagles **most likely** encounter the strongest updrafts? Why? (1 mark)

Continued

Continued

b. A naturalist stated, "These birds hardly ever flap their wings; they're solar-powered." Why would the naturalist describe eagles as solar-powered? (1 mark)

c. Calculate the average speed, in km/h, for a migrating eagle that spends 11 hours per day flying the maximum distance. (2 marks)

d. An eagle was observed to power-glide at maximum speed between two peaks for 3.0 minutes. Determine the distance between the peaks. (2 marks)

You have now completed the examination.
If you have time, you may wish to check your answers.

Performance Assessment

- *Task 1: Heating Water Efficiently*
- *Task 2: Using Plant Cells to Determine Salt Concentration*
- *Task 3: Designing a Cold Pack*
- *Task 4: Analyzing Uniform Motion*

CLASSROOM ASSESSMENT MATERIALS

Science 10 *Name* _____

Performance Assessment

Description

Time allotted: 3 h

Total possible marks: 32

This is a **closed-book,** performance assessment consisting of four activities, each with a value of eight marks.

A science data booklet is provided for your reference.

Instructions

- Fill in the information required on the answer sheets as directed by your teacher.
- You are expected to provide your own scientific calculator.
- Read the entire problem carefully, before beginning.
- Use the supplied materials to perform the task.
- Leave the station as it was when you arrived.
- Your answers **should be** presented in a neat, well-organized manner, using complete sentences, correct units, and significant digits where appropriate.

Task 1: Heating Water Efficiently

Note: *The assessment focus of this activity is on* ***Performing and Recording*** *and on* ***Analyzing and Applying.***

Introduction

Water can be heated by a variety of energy sources. Efficient use of energy is encouraged to protect the environment and make good use of our natural resources. Heating water efficiently in the home can also serve to reduce the cost of energy.

Planning and Designing

Problem

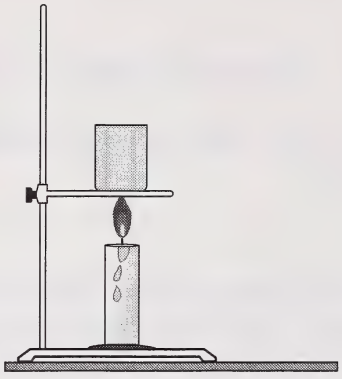
How can a heating method be made more efficient?

Prediction

Make a prediction about the efficiency of heating water with a candle.

Experimental Design

Water is heated by burning a candle. The output energy is determined from the temperature change of a measured mass of water. The input energy is calculated from the mass of burned wax and the heat of combustion of wax. A method is developed for increasing the efficiency of the candle heater.



Materials

- water
- graduated cylinder
- thermometer
- balance
- stirring rod
- candle
- small tin can
- ring stand
- base for candle (lid from tin can)

Safety Precautions

Tie back long hair and roll up loose sleeves before lighting the candle.

Performing and Recording

Procedure

1. Determine the initial mass of a candle.
2. Using a graduated cylinder, measure 200 mL of cold tap water into a small tin can.
3. Measure the temperature of the water, then use the ring stand to suspend the can over the candle.
4. Light the candle.
5. Heat the water until its temperature is approximately 40∞C.
6. Measure the final temperature of the water and the final mass of the candle.

Evidence

- Record the data collected in a suitable table.

Analyzing and Applying

Analysis

1. Calculate the energy absorbed to heat the water, using the formula, $Q = mc\Delta t$.

2. Given that the heat of combustion of candle wax is 47.2 kJ/g, calculate the energy given off by the burning candle.

3. Calculate the efficiency of heating water with the burning candle.

Application

Describe two ways of improving the heating efficiency of the candle.

Performing and Recording

Evidence (table)

Analyzing and Applying

Analysis

1.

2.

3.

Application

Task 2: Using Plant Cells to Determine Salt Concentration

Note: *The assessment focus for this activity is on* ***Performing and Recording*** *and on* ***Analyzing and Applying***.

Introduction

Scientists frequently use living cells to test the effectiveness of chemicals, drugs, or hormones. This technique, termed bioassay, can also be used to determine the strengths or concentrations of prepared solutions, such as vitamin A or D extractions. A microscope is often used in conjunction with bioassay techniques.

Planning and Designing

Problem

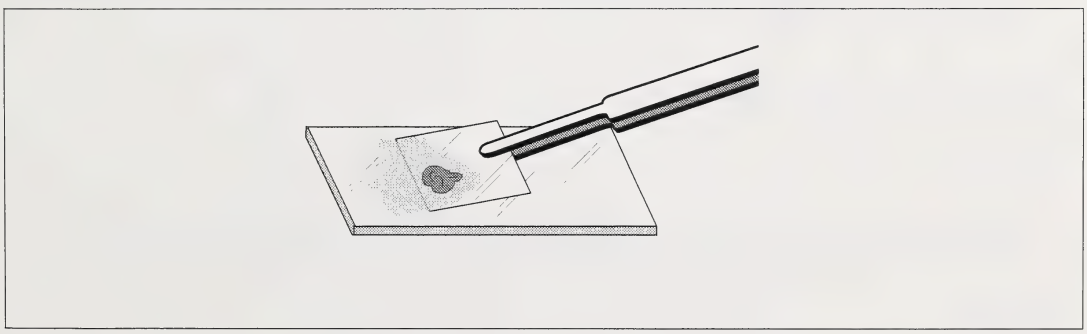
Can living plant cells be used to identify the salt concentration of unknown salt solutions?

Prediction

Observations of changes in living plant cells exposed to various solutions can be used to estimate the salt concentration of solutions applied to them.

Experimental Design

Wet mounts of onion epidermal tissue are exposed to three different solutions. The osmotic effect on the cells is then used to estimate the salt concentrations of each solution.



Materials

- microscope, slides, and cover slips
- onion pieces
- forceps
- scalpel
- lens tissue paper
- unknown solutions marked A, B, C containing of 0.9 percent $NaCl_{(aq)}$, 5.0 percent $NaCl_{(aq)}$, and distilled water

***Note*:** Methylene blue solution may be needed to stain the onion epidermis.

Safety Precautions

- Wear an apron or lab coat and safety glasses.
- CAUTION: Use care when handling the scalpel, as the blades are extremely sharp.

Performing and Recording

Procedure

1. Prepare wet mounts of the thin layer of onion epidermis with salt solution A, B, or C.

2. Make the necessary adjustments to observe the wet mounts under high power.

3. Observe one or two cells in each wet mount. Locate the cell wall, cell membrane, and cytoplasm.

Evidence

Enter your observations on the data table. Include a labelled diagram for each observation, in addition to your descriptions.

Analyzing and Applying

Analysis

Based on your observations, determine which of the solutions A, B, and C contains 0.9 percent $NaCl_{(aq)}$, which contains 5.0 percent $NaCl_{(aq)}$, and which is distilled water.

Synthesis

This procedure indirectly determines solute concentration of the cytoplasm in the onion cells. State a hypothesis regarding the solute concentration of the cytoplasm of these onion cells.

Performing and Recording

Evidence

Solution	Observations of Cell Characteristics

Solution	Cell Shape Sketch

Analyzing and Applying

Analysis

Synthesis

Task 3: Designing a Cold Pack

Note: *The assessment focus of this activity is on* ***Planning and Designing*** *and on* ***Analyzing and Applying****.*

Introduction

A cold compress is recommended to immediately reduce swelling due to an injury. While ice can be used for this purpose, a more recent development has been the chemical cold pack, which can be kept at room temperature. When it is squeezed, an endothermic chemical change occurs and the pack becomes quite cold.

Planning and Designing

Problem

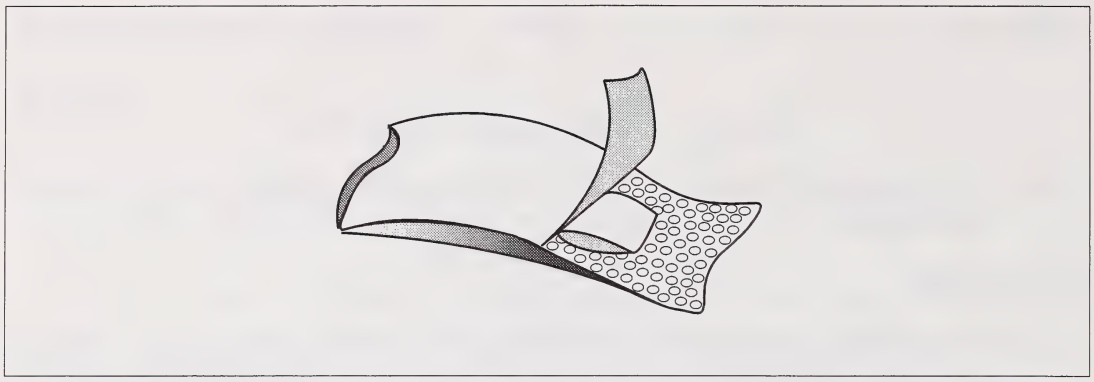
Can you determine the appropriate amount of chemical to use in a cold pack that could function to reduce the swelling from an injury?

Background Information

An endothermic change takes place when ammonium nitrate is dissolved in water. The energy for this change is absorbed from the surroundings.

Experimental Design

Design a procedure and perform an experiment to determine an appropriate mass of ammonium nitrate to put in a cold pack.



Materials

- 10 mL graduated cylinder
- thermometer
- watch glass
- spatula
- balance
- ammonium nitrate solid
- polystyrene cups
- plastic spoon

Safety Considerations

Wear an apron or lab coat and safety glasses. Dispose of solutions in designated containers.

Performing and Recording

Procedure

1. Use the materials provided to determine an appropriate amount of ammonium nitrate to dissolve in 10 mL of water.

2. Perform several tests until a maximum temperature decrease is recorded.

3. Write out the procedure you plan to use and show it to your teacher before proceeding.

Evidence

Record your data in a suitable table.

Analyzing and Applying

Analysis

1. Calculate the change in temperature for each test.

2. Which amount of ammonium nitrate causes the greatest temperature change?

Application

Propose a design for a workable cold pack, based on the results of this investigation. Include a description of

- the amount of ammonium nitrate and water to use
- the materials to use in its construction
- a design that allows the chemicals to react only when needed.

Planning and Designing

Procedure

Performing and Recording

Evidence (table)

Analyzing and Applying

Analysis

1.

2.

Application

Task 4: Analyzing Uniform Motion

Note: *The assessment focus of this activity is on* ***Performing and Recording*** *and on* ***Analyzing and Applying****.*

Introduction

Aerial highway patrols monitoring traffic use the relationship among distance, speed, and time to determine vehicle speeds by measuring the time taken to travel a measured distance.

Planning and Designing

Problem

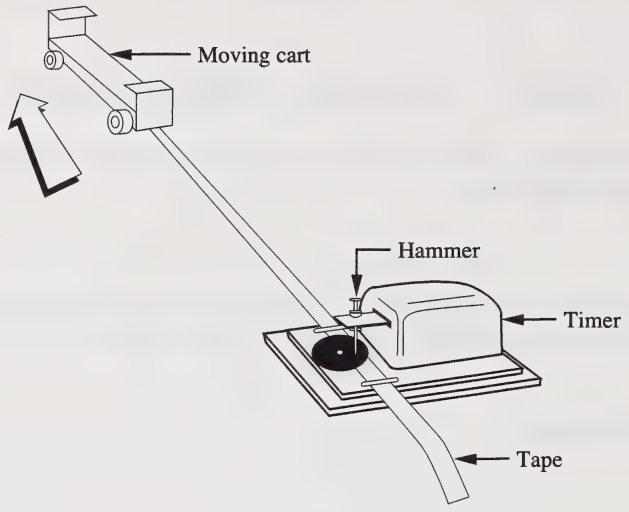
What is the relationship among distance, speed, and time during uniform motion?

Background Information

An interval timer can be used to record the movement of a small cart moving across a table.

Experimental Design

Data are obtained from a series of dots produced by an interval timer. A distance–time graph is plotted, and the corresponding speed determined.



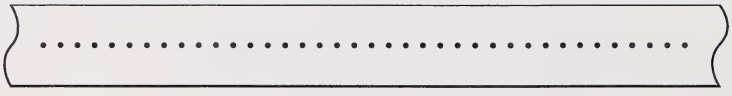
Materials

- interval timer evidence
- metric ruler
- pencil
- graphing grid

Performing and Recording

Use the following data to perform this activity.

Interval Timer Tracing



Procedure

1. Identify the first distinct dot where the tracing becomes uniformly spaced. Label it 0.
2. Circle every sixth dot **after** the starting point and label these 1, 2, 3, etc. Each of these intervals indicates 0.10s.
3. Measure the distance travelled for each six-dot interval.
4. Determine the cumulative distance.

Evidence

Organize your data in an appropriate table.

Analyzing and Applying

Analysis

1. On the grid, plot a distance–time graph.
2. Use the graph to determine the speed.

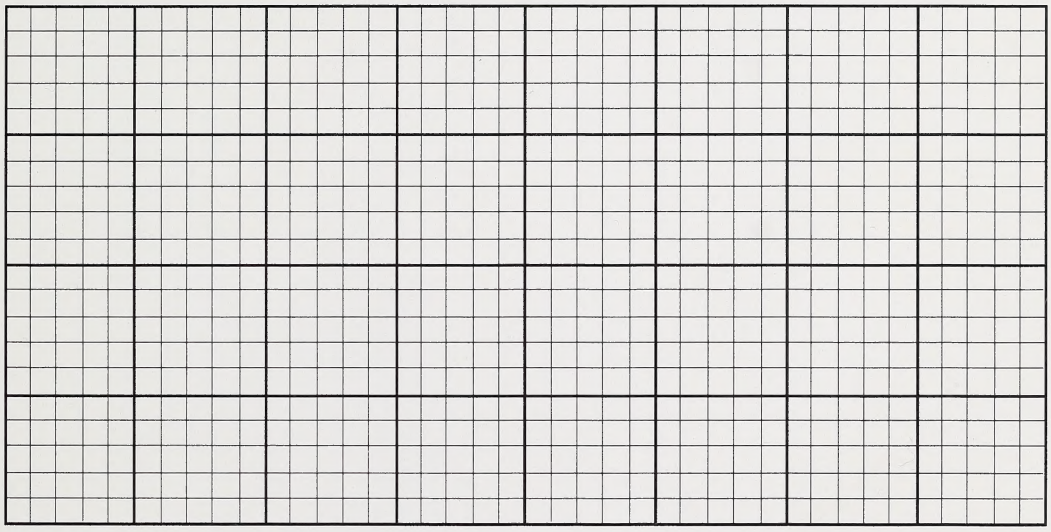
Performing and Recording

Evidence (table)

Analyzing and Applying

Analysis

1.



2. Calculate the slope to determine the speed of the cart.

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